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Charles Brantley
Micron Technology, Inc.
8000 S. Federal Way
Mail Stop 525
Boise, ID 83716

EXAMINER	
KILDAY, LISA A	

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Paper No. 0104

Application Number: 09/825,613
Filing Date: April 03, 2001
Appellant(s): SHARAN ET AL.

Sharan et al.
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 8/29/03.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences, which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is incorrect because the office is withdrawing all 112 rejections including ¶1 rejection of enablement for the term "ion promoting atmosphere", a §112, ¶1 rejection of enablement for plasma of 50-90% of a metal-containing gas, and a §112, ¶2 rejection for the indefiniteness of the term "50-90% of a metal-containing gas." The only issue remaining on appeal is §102 rejection.

(7) Grouping of Claims

The rejection of claims 1-4 and 29 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

6,051,286	ZHAO ET AL.	04-2000

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-4, 29 rejected under 35 U.S.C. 102(e) as being anticipated by Zhao et al. (6,051,286). In re claim 1, Zhao teaches a process of PECVD deposition of metal films (title; abstract; col. 12, lines 45-50; col. 36, lines 18-24; col. 37, lines 52-56) by contacting a substrate with a plasma of approximately 50-90% of a metal containing gas in said ion promoting atmosphere (col. 36 lines 13-67).

In re claim 2, Zhao teaches helium as an ion promoting gas (col. 2 lines 10-12).

In re claim 3, Zhao teaches that the temperature range is approximately 150-500C (abstract, col. 3 lines 38-40, col. 4 lines 60-62).

In re claim 4, Zhao teaches that the pressure range is 1 mTorr to 10 Torr (col. 6 lines 52-53).

In re claim 29, Zhao teaches contacting a surface (title; abstract; col. 5, lines 30-36; col. 37, lines 51-56) with a plasma of approximately 50-90% metal containing compound in a chemically inert atmosphere (col. 36 lines 21-24 and 41-67).

(11) Response to Argument

On pages 3-6 of the brief, applicant's representative argued with regard to three 35 U.S.C §112 rejections including a §112, ¶1 rejection of enablement for the term "ion promoting atmosphere", a §112, ¶1 rejection of enablement for plasma of 50-90% of a metal-containing gas, and a §112, ¶2 rejection for the indefiniteness of the term "50-90% of a metal-containing gas." For purposes of this appeal, the examiner is withdrawing all 35 U.S.C. §112 rejections.

At this time, the only issue in this Appeal is the 35 U.S.C. §102 rejection of the claims over Zhao et al. (6,051,286). On pg. 7, the applicant's representative argues that Zhao et al. is not applicable to claim 1 because Zhao et al. discloses only gas delivery. Applicant's point is not persuasive. First, Zhao et al.'s invention is for the PECVD deposition of metal films, specifically Titanium, in a PECVD chamber (abstract). Second, Zhao et al. discloses a metal-containing gas, Titanium chloride ("TiCl4"), (col. 36, lines 44-47). Third, Zhao et al. discloses that the flow rate of the metal-containing gas is about 53% of the final flow rate (col. 36, lines 40-43). Fourth, Zhao et al.

discloses forming a plasma of the metal-containing gas (col. 36, lines 13-20). Fifth, Zhao et al. discloses that the plasma of the metal-containing gas is in an ion promoting atmosphere (col. 36, lines 18-27). Specifically, Zhao et al. discloses that the ion promoting atmosphere is Hydrogen and the presence of Hydrogen gas speeds up the reaction because it lowers the energy required for the decomposition of the metal-containing gas in order to form a metal film on the substrate (col. 36, lines 18-27). Sixth, Zhao et al. discloses that the ion promoting atmosphere accounts for approximately 11% of the total initial flow rate (col. 36, lines 34-37). Thus, Zhao et al. discloses that the plasma contains approximately 89% of a metal-containing gas. Since the plasma contains approximately 89% of a metal-containing gas at the initial flow rate, Zhao et al. satisfies the range of approximately 50-90% of a metal-containing gas in said ion-promoting atmosphere.

Applicant's representative admits on pg. 7, lines 5-7 that Zhao et al. discloses that Hydrogen gas lowers the energy required for decomposing a source gas to form a desired film. According to the applicant's instant specification (¶44) an ion promoting atmosphere can be used to:

> enhance, increase, improve, augment, amplify, help, boost, develop, or similarly affect at least one factor in the process, such as the deposition rate, the etch rate, sputter rate, ionization, the rate of reaction between a precursor and a reactant, uniformity of deposition, the density of the film deposited, integrity of the layers, production throughputs of the semiconductor devices, and the efficiency of deposition. The use of a reaction promoter can also involve shortening the process time.

When Hydrogen gas is used to lower the energy of the plasma during deposition, Zhao et al. discloses several benefits including but not limited to: enhancing the

process, improving the process, helping the process, and making the process more efficient. Therefore, Zhao et al. discloses an ion promoting atmosphere as defined by the applicant's instant specification in order to lower the energy of the plasma during deposition, which improves the process and makes the process more efficient.

On pg. 7, lines 6-15, applicant argues that Zhao et al. teaches gas delivery but does not teach contacting a substrate with a plasma of approximately 50-90% of a metal-containing gas. Applicant's point is not persuasive for the following reasons. First, applicant admitted on pg. 7, lines 5-7 that Zhao et al. discloses that Hydrogen gas is used to lower the energy required for decomposing a source gas to form a desired film. Zhao et al. teaches that the source gas is a metal-containing gas such as TiCl4 (col. 36, lines 43-47). Zhao et al. discloses that Hydrogen gas is the ion promoting atmosphere (col. 36, lines 18-27). Second, Zhao et al. discloses that the combination of Hydrogen with TiCl4 results in forming "the desired film" and the byproduct of Hydrogen chloride ("HCL"), (col. 36, lines 22-27). Third, Zhao et al. discloses depositing a metal film (title; abstract; col. 1, lines 45-50; col. 36, lines 18-24; col. 37, lines 52-56). Finally, the only product that can result on the substrate from the plasma deposition of Hydrogen, inert Helium, and TiCl4 is a Titanium film.

On pg. 7, lines 16-20, applicant's representative argues that Zhao et al. does not discloses Helium as a ion promoting gas. Applicant's point is not persuasive for four reasons. First, ion promoting atmosphere is not a limitation in

claim 2 because it is found in the preamble. Second, Zhao et al. teaches Helium (col. 36, lines 18-36). Third, Zhao et al. teaches that Helium can be used as an ion promoting atmosphere like Hydrogen (col. 36, lines 32-34). Therefore, Helium is serving the same function as Hydrogen in the mechanism of forming a film. Zhao et al. specifically addresses in col. 36, lines 33-34 how when the gases such as Helium or Hydrogen are used, these gases exhibit high thermal transfer characteristics. Fourth, in ¶29 of the instant specification refers to TiCl4, Hydrogen, and the reaction promoter gas. ¶30 refers to Argon as being the "reaction promoter gas." ¶37 of the instant specification states that other noble gases such as Helium may be a substitute for Argon as the reaction-promoter gas. Therefore, if Zhao et al. discloses Helium as a reactant gas, he is inherently disclosing Helium to perform the same functions as other reactant gases. One skilled in the art would recognize that the formation of Titanium from Helium, Hydrogen, and TiCl4 is inherently the same process as the instant claims because Zhao teaches Hydrogen and Helium as an ion promoting atmosphere which contacts a plasma of 50-90% of a metal-containing gas TiCl4 to form Titanium. There is nothing to suggest in either the application or in Zhao et al. that another product would result from this mechanism.

Regarding claim 29, applicant argues that Zhao et al. fails to disclose containing a *surface* with a plasma of approximately 50-90% metal-containing *compound*. First, Zhao et al. discloses forming a plasma of 50-90% metal-containing compound of TiCl4 (col. 36, lines 18-26, 40-45). TiCl4 is a metal

containing compound. Second, Zhao et al. discloses a closed chamber process such as Plasma Enhanced Chemical Vapor Deposition (PECVD), (title; abstract; col. 5, lines 30-36; col. 37, lines 51-56). Third, Zhao et al. discloses contacting a surface (col. 37, ~~lien~~ lines 51-58). Since Zhao et al. discloses depositing a film in a closed chamber, there is nothing to suggest that the plasma of metal-containing compound would not contact a surface.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

KAMAND CUNEO
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

Lisa Kilday
June 29, 2004

Conferees
Brian Sircus
Kamand Cuneo

BRIAN SIRCUS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

Charles Brantley
Micron Technology, Inc.
8000 S. Federal Way
Mail Stop 525
Boise, ID 83716